Increasing Population and Industrialization Threaten the Bay's Ecosystem: The Sewer Era and Efforts to Clean It Up, 1870-1992

Galveston Bay, like Chesapeake Bay, has struggled to maintain itself when the population of the area increased and advancing technology exploited the natural resources. Similar to the abundant marine life, the vast water system at first seemed impregnable to dumping foreign materials into the waterways, but by the 1960s fishermen, environmentalists, and recreational users of the bay began complaining about its deteriorating condition and urging that corrective steps be taken.

In 1973, James Noel Smith, an environmentalist, completed a study of the bay and noted hopeful signs that it might not "succumb to the voracious appetite...for growth and development" that disregarded environmental consequences. Yet the title of his article in the *Sierra Club Bulletin* was "The Doubtful Future of Galveston Bay" (Smith, 1973:25).

Houston and Galveston Water and Sewage Problems

As early as 1839 a visitor to Houston noted the amount of soil washing down Main Street and into the bayou after every rain that threatened to fill the steamboat landing. By 1841 the city forbade the steam sawmill at the junction of White Oak and Buffalo bayous from piling sawdust along the banks, again to prevent clogging the stream, not concern for pollution (Sibley, 1968:52).

Early Houstonians drew water from the bayou and collected rainwater in cisterns while those who could afford better, bought it from cartmen who filled casks at local springs. A newly arrived housewife in 1839 remarked that the bayou water was *"pleasant-but muddy...I* don't wonder at all the clothes being spoilt that are washed in this water" (Gray, 1967:151).

Houston's first waterworks was built in 1870. The contractor dammed the bayou above the Preston Avenue bridge for his intake pipe which would supply a reservoir and would pump water to fire hydrants and homes. The poorly planned system had many problems including insufficient pressure for fires. Complaints about foul bayou water led to drilling artesian wells, but the water was piped around in the same mains as the polluted bayou water. Cities did not begin to use chlorine to disinfect water until about 1910 and Houston did not use it until 1933 (McComb, 1969:127- 130).

Street drains and sewers emptied separately but directly into Buffalo Bayou through vitrified pipe and brick sewers *(The Industrial Advantages of Houston...,* 1894:5). By 1893 people said that fish died in the bayou from "creosote poisoning." The city engineer reported that solids from toilets appeared in the bayou and a newspaper reporter described a sewer pipe that was flushing 40,000 gallons a day from the Houston and Texas Central Railway shops into the bayou just above the dam. A committee of doctors reported that a dozen privies along the bank above the dam also contributed to pollution as did the old city smallpox graveyard, the cottonseed oil mill and the cattle yards and a dead cow. The cattle waded into the bayou and stirred the mud when drinking. Nevertheless, the city continued to use bayou water for emergencies. Finally the federal government forced the city to act when Houston began agitating for a deep water ship channel to come to the foot of Main Street in the mid-1890s. The Corps of Engineers said that the government "had no intention" of cleaning the sewage out of the bayou and the city had better get busy solving its problem (McComb, 1969:129-130; *Houston Post,* May 3, 1895).

The city built a sewer system in 1899 with a central pumping station on the northeast side where siphon pumps brought the sewage across the bayous. There it was forced through filter beds located nearly five miles outside of town. The heavy matter stayed in the beds and dried until workmen with rakes removed it. The remaining sewage was filtered through various layers and the final effluent entered Buffalo Bayou via an open canal. Six years later the filters were processing only half of the city's waste and the system was not working properly. More disposal plants were built but by 1916 the mayor estimated that from 70 to 80 percent of the raw sewage went directly into the bayou. A reporter also found 35 private sewers draining into the waterway (McComb, 1969:131-132).

Unsafe disposal of sewage continued and in 1967, Baylor University Medical School's Dr. Joseph L. Melnick, an expert on virology and epidemiology, found a wide range of bacteria and viruses including those causing encephalitis and meningitis in Buffalo Bayou. At the foot of Main Street, he said, were enough viruses to infect 77 million people every hour. By the early 1970s, the city treated its raw sewage with chlorine when it knew it was going untreated into the bayou (Smith, 1973:26). Twenty years later, Houston still discharges raw sewage into the bayou because of breakdowns in equipment and flooding (Benson, 1991).

How much of this sewage reached Galveston Bay or what was its effect was not discussed at the turn of the century. But when coupled with the island city's record and the practices of lesser cities rimming the bay, it was a factor in bay pollution. A notable outbreak of gastro enteritis occurred in Galveston after an oyster dinner in 1944 and raised temporary public concern for the safety of the bay oysters (Stanley, 1989:Chapter 7[pl3]; Ward and Armstrong, 1991:1).

Life on Galveston Island had unique problems because underground brackish water was only a few feet below the surface making wells impractical. The islanders depended

on cisterns until the 1880s when deep wells produced plenty of water but it too was brackish and ruined pipes. Finally the city contracted for deep wells on the mainland at Alta Loma west of Hitchcock and by 1895 the city had plenty of water although the water table at the source began to drop (McComb, 1986:102-104).

Likewise waste was a problem on the barrier island. At first private cartmen collected trash, offal, and slops from alleys and street gutters and dumped it all off the eastern end of the island. In the 1880s the city established a municipal dump on the bay shore at 33rd Street (McComb, 1986:99).

The *Galveston Daily News* estimated in 1875 [when the population was around 20,000] that 875 tons of fecal matter and over 2,000,000 gallons of urine were produced each year by humans in the city while horses manufactured 20 pounds of manure and 20 gallons of urine each day which was absorbed by the sand. The city physician complained in 1887 that the scavengers emptied the privies into barrels at night and the careless cartmen left a trail of "their horrible freight" all the way to the Gulf where it was dumped. Getting rid of surface water was a problem on the island and open ditches were used until the late 1860s when some were lined with wood. But the system was imperfect and streets became lakes when it rained. Even worse, some building owners connected toilets to the open drains. Between 1886 and 1893, the Galveston Sewer Company, a private contractor, laid pipes between the bay and Broadway from 14th and 27th streets (McComb, 1986:99-100). But there was no treatment plant on the island until after World War II. In 1901 all householders had to connect to city sewers and a city ordinance required the sewer company to have the main outlet into West Bay at the foot of 25th Street to be at least two feet below mean low tide to prevent unpleasant odors from escaping (Galveston, 1902:586, LXI; *Galveston Daily News,* 1884-1900 sewage articles).

Thus by 1900, Houston had made some improvements in handling sewage while Galveston and the smaller communities moved slowly from outhouses and cesspools (a forerunner of the more sanitary septic tank) to city sewers. Raw sewage continued to enter the bay but in the 1930s it received less attention from the public than did visible oil slicks and waste oil (Ward and Armstrong, 1991:1-2).

Galveston County officials conducted a study in 1950 and discovered that most of the municipalities around the bay dumped raw sewage into local waters. By 1963 Offatt's Bayou was so polluted that the city banned swimming while occasional cases of infectious hepatitis appeared and islanders complained about loose bowels. A federal panel dealing with water pollution visited the area in 1970 and found Galveston dumping raw sewage into West Bay. Nor did the port provide sanitary facilities for ships in the harbor. The city normally passed 7 million gallons of sewage per day and only 40 percent was adequately treated; during rainy weather when storm drain water overburdened the system, 25 million gallons might enter the bay. Acting under a threat of a daily fine by the Texas Water Quality Board, Galveston proposed to build separate storm sewers and

to chlorinate its effluent, but progress was slow. A fine of $30,450 was imposed in 1974 for dumping raw sewage into Offatt's Bayou (McComb, 1986:203-204).

The Texas Water Quality Board was created in 1967 and assumed the regulatory duties of the Texas Water Pollution Control Board which had been mandated six years earlier. This seven-member board included the director of the Texas Water Development Board (concerned with encouraging the use of surface water), the state health commissioner, the director of Texas Parks and Wildlife, the chair of the Railroad Commission, and three appointees from the public. The board had the power to issue permits and control pollution (Branda, 1976:1084-1085).

Pollution from human waste is still a problem for Galveston Bay but industrial effluent, sometimes toxic, has caused concern since the turn of the century.

The Beginning of Oil Drilling in Galveston Bay and the Baytown Refinery 1903-1919

Baytown Landing on McKie Peninsula enclosing Black Duck Bay and Busch Landing on Goose Creek served the quiet agricultural communities on the east side of the San Jacinto estuary at the turn of the century. The only industries in the neighborhood were small boatways at Goose Creek and brick kilns along Cedar Bayou. Local fishermen often complained that the rising bubbles in Tabbs Bay, the usual sign of feeding fish, seldom resulted in a catch. In 1903 an inquisitive oil scout, inspired by the gusher at Spindletop on January 10, 1901, lighted a match near the mysterious bubbles and brought the petroleum era to Galveston Bay (Henson, 1986:74-75).

The first producing well was on the shore of Tabbs Bay in 1907 but production from it and other wells in the field was modest. By 1915 when the August hurricane brought sixty-mile-an-hour winds and a fourteen foot tide to Goose Creek, there were at least twenty-five wooden rigs working around Tabbs Bay producing about 130,000 barrels of oil per year. The real boom began in August, 1916, when Galliard #1 produced 8,000 barrels per day from a depth of 2,017 feet. Although production soon dropped, the following August saw Sweet #ll-with a daily production of only 400 to 500 barrels a day-suddenly blew out spewing 25,000 barrels of oil over the area. Shooting 250 feet into the air, the gusher created a 2-inch deep lake covering ten acres! The south wind carried slimy green oil eight miles up the estuary to Highlands making the dirt roads too slippery for driving and coating the trees with shiny oil (Henson, 1986:78-79).

In 1918, a third August gusher, Sweet #16, erupted when natural gas sent the wash pipe through the crownblock wrecking the derrick. An expelled rock struck a metal fragment and ignited the gas; the resulting explosion rocked the countryside and the well remained out of control for eleven days. An estimated 10,000 barrels of oil created a slick on Tabbs

Bay and became the first reported ecological disaster when it floated down into Galveston Bay. The untidy oil field camp on Goose Creek became a boomtown of tents and shacks between 1917-1919, the years of peak production, with 7-9,000,000 barrels per year. By 1924 production dropped to only 4,000,000 barrels but the Goose Creek field remained the third largest in Texas following Humble and Sour Lake (Henson, 1986:80-82).

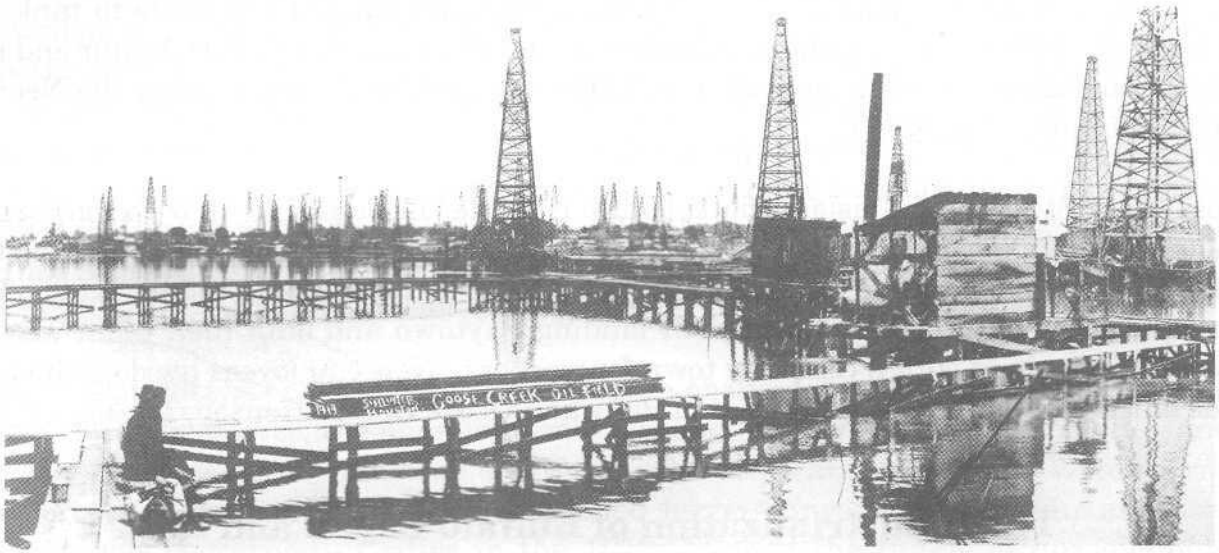

Illustration lla.-Goose Creek Oil field. (Source: Rundell, 1977.)

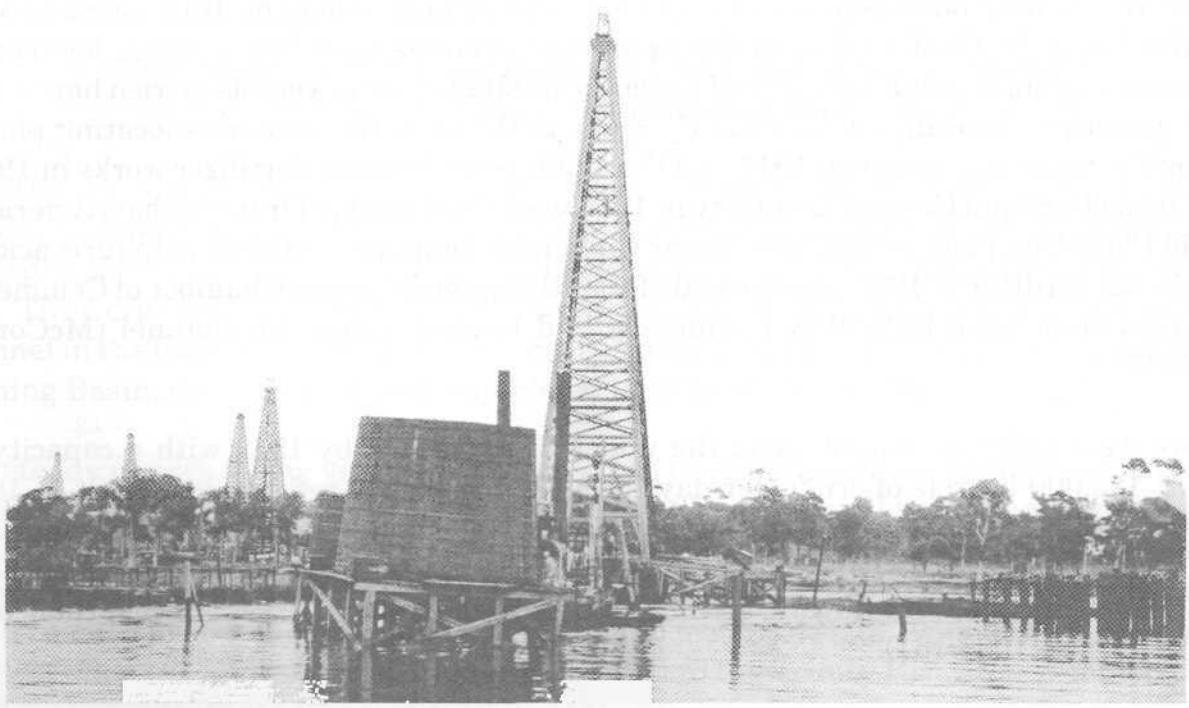

Illustration llb.-Goose Creek field. (Source: Rundell, 1977.)

At this time Tabbs Bay and the shoreline had perhaps 1,500 wooden and steel derricks placed close together sometimes sharing a drilling platform with a neighbor. Those in the bay were connected by long, elevated walkways with small storage tanks, tool sheds, and boilers hanging over the edges. The rickety construction allowed crude oil to leak, drip, and spill into Tabbs Bay. At first drillers pumped the crude oil into huge shallow pits filled with water, but soon cypress storage tanks holding about 20,000 gallons dotted the shore and on Hog Island where four-inch pipelines carried the crude to tankers. Prior to 1919 the most convenient refineries were in Beaumont and Port Arthur and the major companies soon built pipelines from Goose Creek to their plants on the Neches River (Henson, 1986:82-83).

Ross Shaw Sterling and his associates in the Humble Oil Company (now Exxon) began their refinery at Goose Creek in 1919. The site was ideal being located on the Houston Ship Channel where large tankers drawing up to 22 feet could be accommodated. The Humble board of directors named their landing Baytown and built their plant west of Goose Creek along with a company town for workers. Non-employees lived on the east side of the creek in the communities of Pelly and Goose Creek (Henson, 1986:83-85).

The Industrialization of Buffalo Bayou and the Enlargement of the Houston Ship Channel

At the close of World War I in 1918 there were twenty-two industries along the bayou below the turning basin and sixteen above it. The stretch above the Turning Basin was dredged to a depth of 10 feet to the municipal wharves near Main Street for barges transporting shell, sand, lumber and cotton while shallow draft vessels carried hardware, and groceries (Alperin, 1977:111-113). Some of the earliest industries locating plants along the waterway between 1914 and the 1920s were Armour Fertilizer works in 1914; the Texas Portland Cement Company in 1916 used shell dredged from the bay; American Maid Flour Company in 1922; the Texas Chemical Company produced sulphuric acid in 1920 and fertilizer in 1922. By the end of the 1920s, the Houston Chamber of Commerce bragged that more than fifty businesses had located along the channel (McComb, 1969:117).

There were eight refineries along the upper ship channel by 1929 with a capacity of about 125,000 barrels of crude per day. The Galena-Signal refinery was built in 1916 (and was bought by The Texas Company in 1928), Sinclair completed its refinery in 1918, Deep Water in 1919, Humble 1919-1920, Crown Central, Clarion, and American Petroleum in 1920, and Royal Dutch Shell began its plant in 1929. All had their own docks (Sibley, 1968:161).

Texas City got its first refinery in 1908 and the site has continued under various names until the present, the latest being Texas City Refining, Inc. The 1930s brought Republic

Oil (later Marathon) and Pan American (Amoco) but it was World War II that brought increased industrialization. In 1941 Union Carbide opened and Monsanto leased the old sugar refinery to produce styrene for synthetic rubber.

Union Carbide became the largest industrial ethyl alcohol plant in the world and a large producer of polyethylene plastics made from "air, water, salt, and sulphur." The U. S. government built the tin smelter in 1942 which became the Gulf Coast and Metallurgical Corporation after the war. Texas City looked forward to more development after 1946 but the disastrous explosion of the ammonium nitrate fertilizer on board the *Grand Camp* at the docks on April 16, 1947, the resulting explosion of the *nearby High Flyer*, and subsequent fires at various shore installations ended the boom for dry cargo facilities. The port remains, however, a favorite location for the refineries and new chemical plants such as General Aniline and Film Corporation that opened in 1968 and produces high-pressure acetylene chemicals (Mabry, 1978:8, 16-17, 19-20).

All of these industries were attracted to the ship channel for its deep water, available acreage, local incentives, the abundant underground fresh water (usually on-site), and the ease of disposing of industrial waste into the air, water, and soil. Water-borne transportation companies, likewise, remained largely unregulated insofar as water pollution was concerned. Critics in the 1970s blamed the tangle of jurisdictional responsibilities and bureaucratic timidity for the lack of control over ship wastes (Smith, 1973:26).

Deepening and Widening the Houston Ship Channel and Public Concern over Industrial Pollution

By 1919 the petroleum industry wanted a wider channel for the increasing use of the relatively inexpensive barge traffic favored for the Houston Ship Channel. These barges ranged in length from 125 to 200 feet, 30 to 38 feet wide, and drafts between 6 and 15 feet. The Corps of Engineers recommended a depth of 30 feet in 1919 and widening the channel in the bay to 250 feet and in the San Jacinto River to 150 feet plus enlarging the Turning Basin, changes that were completed in 1926 (Alperin, 1977:111-112).

The steady growth in the volume of traffic led to deepening and widening the Houston Ship Channel during the 1930s to 32 then 34 feet. World War II brought a shipyard for Liberty Ships and other defense projects and spawned the petrochemical industry beginning with manufacture of synthetic rubber at Baytown and Texas City. The channel was deepened to 36 feet in the late 1940s and to 40 feet in the late 1950s. The 8-foot-deep 125-foot-wide cut from the Houston Ship Channel to the Trinity River was completed in 1960 for barge traffic (Alperin, 1977:113-114).

In the 1920s the public began blaming the petroleum industry for the decline in fishing. "It is a common thing for fishermen...to remark that times are not what they used to be when phenomenal catches were made," wrote the editor of the 1929 Texas Game, Fish, and Oyster Commission (TGFOC) annual report. He cited a *Houston Post-Dispatch* article in 1920 that declared fishing in the ship channel was ruined and that "Bathers often received generous coatings of oil." As early as 1910, the *Post Dispatch* said, the channel was smeared with oil and other destructive ingredients from the foot of Main Street to Morgan's Point (Ward and Armstrong, 1991:11). Oily water at the foot of Main in 1910 must have come from the careless use of fuel oil.

The TGFOC, however, noted improving conditions in 1928 when a clean-up campaign reduced waste oil which had posed "a grave fire hazard." Moreover, it bragged, the recent fishing season was the best in the past ten years. The ship channel was "virtually free" of oil pollution and the bay once more teemed with aquatic life. Yet problems continued and five years later the TGFOC praised the "honest effort" that the refineries were making to take care of their waste, blaming current pollution on inbound ships dumping waste in the bay. The agency report in 1946, however, noted a decline in bay fisheries and predicted low volume catches "until the heavy industrial pollution" abated. Channel-area polluters continued to receive criticism and within the past twenty years the ship channel has been described as "the most-polluted" waterway in the U. S. (Ward and Armstrong, 1991:11-12).

A plan to widen and deepen the Houston Ship Channel surfaced again in 1967 when a Congressional committee asked the Corps of Engineers to review navigation projects in the Bay (Davis, 1992). But the request came at a time when the public was becoming more aware of pollution damage in the air, water, and soil, and the study had to await the review processes instituted by the National Environmental Policy Act of 1969. The act forced industry, builders, and even the Corps of Engineers to file environmental impact statements (EIS) before commencing any project that might harm the environment (Alperin, 1977:277).

The Corps of Engineers issued its EIS for deepening and widening the Houston Ship Channel in 1988, but it was met by sizable opposition. Additional studies resulted in a second EIS to deepen the channel from 40 to 50 feet and to widen it gradually to 600 feet. How to dispose of the estimated 57 million cubic yards of mud, clay, sand, and shell remains under discussion in addition to the impact of dredging (Davis, 1992).

Water quality in Galveston Bay has improved. In 1980, a decade after passage of the National Environmental Policy Act, the Environmental Protection Agency announced that the Houston Ship Channel was a "water-quality success story" (Ward and Armstrong, 1991:12). Some recent scholars evaluating the quality of the water and sediment in Galveston Bay believe that in the past too much reliance has been placed on anecdotal material while overlooking variables such as cold weather, hurricanes, and floods. Their studies, more scientific in method, try to find measurable criteria for examination. In

1968 two agencies undertook a study of coliform and BOD levels in the bay-one by the Texas State Department of Health and another by the Texas Water Quality Board. These studies and more recent analyses conclude that definitive statements are difficult because of an insufficient data-base. The on-going efforts by the Galveston Bay National Estuary Program to assess the evolution of water and sediment quality in the Bay will make use of recent efforts to synthesize available data to produce a Comprehensive Conservation and Management Plan for Galveston Bay (Ward and Armstrong, 1991:12-14).

While past discharges by municipalities and industries have damaged water quality, there are other detrimental factors harming the bay including subsidence and erosion. Both are naturally occurring processes but the growth in population and industrialization has accelerated the problems.

Technical discussions about subsidence, erosion, and turbid water conditions either because of the increased population and industrial needs or the effect of the three on soil, water conditions, and fisheries are beyond the purview of a historian. From a historical perspective, however, the over-extraction of underground water and oil has contributed to subsidence around the bay. Communities relied on underground water instead of surface water because it was cheaper and quickly available, sometimes even on the site, while developing systems for the delivery of surface water took long-range planning for dams and canals. The creation of the Harris-Galveston Coastal Subsidence District by the Texas Legislature in 1975 has encouraged industry and agricultural irrigators away from dependence on underground water to surface water from Lake Houston (the San Jacinto River watershed) and the Trinity and Brazos rivers.

In 1887 the demand for subsurface water was about 2 million gallons per day which rose dramatically to 495 million gallons daily by 1972. By 1989, industry and irrigation consumed only 15 percent of the total subsurface water while the public used the remaining 85 percent. Some of the public consumption is being shifted from underground to surface water (Reynolds, 1984 and Teutsch, 1977 cited by Canales, 1991:125-126).

Subsidence clearly affected eastern Harris County in the 1970s. The San Jacinto Battleground lost some of its land *as* did Baytown's Brownwood subdivision across the San Jacinto River. This upscale subdivision perched on the high banks of a peninsula surrounding Scott Bay and was annexed to Baytown in 1961. Residents complained that every high tide left trash on the streets and that passing ships caused waves that were eroding the shoreline. High tides during Hurricane Carla in 1961 put three feet of water into many homes, but it was Hurricane Alicia on August 18, 1983 that doomed Brownwood. After the storm, Baytown cut off city services to the peninsula and barricaded the entrances while forbidding residents to repair their homes (Henson, 1986:138-140).

Experts estimate that the Ship Channel and the San Jacinto Monument have sunk nine feet while Pasadena and Baytown have lost about eight feet. Such loss of elevation causes flooding during heavy rains and tidal surges from hurricanes. These inundations

sever evacuation routes and endanger lives. Moreover, surges of salt water intrude into the freshwater and brackish habitats needed for plants and marine life thereby upsetting natural growth processes. Subsidence at Texas City resulted in the building of 16 miles of levees from 15 to 23 feet tall (Canales, 1991:129-130).

Thoughtless pollution and the extraction of underground resources spanning almost one-hundred years have damaged Galveston Bay and its surroundings. Public awareness during the last three or four decades has brought about slow change and has encouraged serious studies about ways to preserve the area and wisely use its resources.